Chapter 10

EVOLVING VIEWS OF THE FUTURE OF THE US FOREST SECTOR

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Abstract. There have been nine post-World War II Timber Assessments, all motivated by three broad questions. Do we have enough resources to meet current and future wants? Can we describe the sustainability of forest resources in the face of increasing demand? Can we identify emerging problems while there is still time to design programs to offset them? Each of the Timber Assessments pictured the future in ways that strongly reflected contemporary views about key drivers of future conditions. Each also evolved in its reliance on underlying models of economic processes to both structure the development of projections and to increase the confidence that can be placed in individual projections. The Timber Assessments have covered a variety of issues, some short term and others that are enduing and universal to forest sectors worldwide. Some of these enduring issues include: how to increase timber supplies before increases in product price reduce consumption excessively, the role that improved harvesting or processing technologies can play in increasing supplies and employment opportunities, how forest growth can be increased through improved forest management, how different land ownership patterns influence forest management, and the role of markets in allocating resources and providing incentives for both improved processing technology and forest stewardship.

Keywords: timber, forest policy, forest planning

D.M. Adams and R.W. Haynes (Eds.), Resource and Market Projections for Forest Policy Development, 353–380.

10.1 INTRODUCTION

Figure 10-1 provides a timeline of the nine post-World War II Timber Assessments[1] separated into two divisions: the Outlook Studies and the RPA Timber Assessments. It also shows some of the major motivating technical questions associated with each assessment. The evolution of these questions suggests there have been changes in both the nature of forest policy issues and a growing concern about how to institute greater rigor in the modeling of key economic processes in the sector.

Three broad questions motivated the Timber Assessments. First, do we have enough resources to meet current and future wants? That is, what is the relative balance of current and future wants and resources? Second, can we describe the sustainability of forest resources in the face of increasing demand? Third, can we identify emerging problems while there is still time to design programs to offset them? The nine Timber Assessments share a number of common elements both in their structure and in their projected views of the future. These common elements include a similar framework, fairly consistent

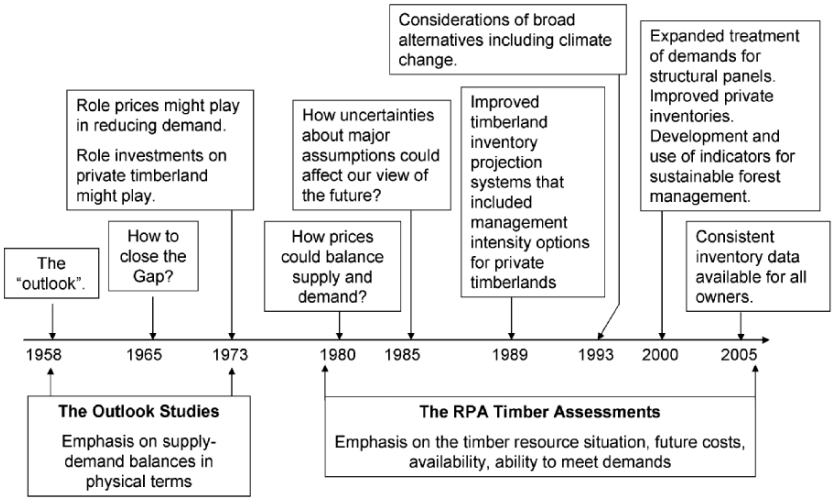

Figure 10-1. Timeline of assessments and motivating technical questions.

[1] The dates used to describe these Timber Assessments are 1958 (USDA FS 1958), 1965 (USDA FS 1965), 1973 (USDA FS 1973), 1980 (USDA FS 1982), 1985 (Haynes and Adams 1985), 1989 (Haynes 1990), 1993 (Haynes et al. 1995), 2000 (Haynes 2003), and 2005 (Haynes et al. 2007).

approaches to estimating consumption, and a focus on describing the resource situation. The Timber Assessments differ in their consideration of prices. After 1980, prices receive a more nuanced and comprehensive treatment.

These three questions led to the development of several process models and a framework for linking them. The actual process models have remained fairly consistent over time, but they have grown richer both in end-use detail and representation of economic functions. The first process model estimated the consumption of various forest products. Outputs were frequently expressed both at the product level in their appropriate units and converted to roundwood equivalent where they could be expressed in common units such as board feet, cubic feet, or cubic meters. The second process model estimated available resources aggregated from timber inventories which were summarized at the region and owner level for hardwood and softwood species. The Outlook Studies relied on either stand table projection methods or simple extrapolations of growth and harvest ratios to describe the future resource situation. Over time, the inventory projection methods have become more elaborate both in computational complexity and in the description of forest resource conditions.

All Timber Assessments have shared a general framework that lays out prospective needs for forest products, the net trade in forest products, and the available timber resources (all described in common units) that can be utilized to meet these needs. This framework supports broad judgments about the "timber outlook". That is, what is the expected trajectory of the national supply–demand relationship? In the 1958 and 1965 Outlook Studies this was a largely descriptive process that did not fully specify supply and demand relations. Direct discussions of the role that prices play in modifying consumption and production levels were missing. The Outlook Studies treated prices independently of quantities in the discussions of consumption and resource conditions. They did consider the implications that rising prices might play in reducing consumption in the long term, but the bulk of the discussion was about supply and demand trends in a priceless world.

In 1973, the general assessment framework was strengthened to include more explicit consideration of prices and the role that trade plays in the US forest sector. This simple framework, shown in the left-most column in Table 10-1 (from the 1973 Outlook Study), has since been used in all Timber Assessments. It clearly lays out the timber consumption and availability issues and illustrates how trade

mediates between consumption and domestic production. This framework, although initially conceived to meet broadscale forestry planning needs, provided guidance for methodological improvements in latter Timber Assessments.

Table 10-1 reduces the discussion of the "timber outlook" to a consideration of the supply–demand balance. Under the assumption that prices remain at their 1970 relative levels, for example, consumption would grow faster than supply from US forests, and by 2000 there would be a gap of 102 Mm^3. Policy discussions then revolved around filling the gap. The Outlook Studies focused on increasing stand productivity or utilization, increased planting and protection, road development in the West, and increasing harvests from NIPF timberlands as ways to expand timber supplies. But many in the policy arena argued an economic framework could not be used for the Timber Assessments without considering how prices through market interactions bring supply and demand into balance. This argument grew stronger as solutions were sought to close the seemingly inevitable gap between supply and demand. In that context, price changes describe market actions and replace the quantity gap as the focus of policy.

This struggle to relate price to supply and demand divides the nine Timber Assessments into three groups. The three Outlook Studies were built using frameworks that included the indirect treatment of prices (the quantity gap). The 1980 (fourth) RPA Timber Assessment was transitional in that it included both indirect and direct treatment of prices. The last five (fifth through the ninth) RPA Timber Assessments were built using a framework that incorporates increasingly sophisticated algorithms to solve for equilibrium in spatially distinct multilevel markets.

This chapter compares base case projections from the nine past Timber Assessments, 1958–2005. We examine the robustness of several common elements (the estimation of consumption and description of timber availability) and the role that explicit consideration of prices has played in improving the utility of the projections, policy deliberations, and stimulating methodological developments. In the discussion we will separate the impacts of changing modeling methods and exogenous assumptions on the projections. We start by examining some common visions of the year 2000 from early Timber Assessments, and consider the role of assumptions in determining key variables. We discuss the impact of methodological improvements for explicit price treatment, and finally, the evidence describing the degree of confidence that can be placed in these projections.

Table 10-1. Summary of US softwood and hardwood roundwood projections to 2000 from the 1973 Timber Outlook

Item	Estimated actual			Projections								
				1970 relative prices			Rising relative prices[b]			Relative prices above 1970 averages[c]		
	1952[a]	1962[a]	1970[a]	1980	1990	2000	1980	1990	2000	1980	1990	2000
	Million cubic meters											
Total US softwood demand	238.0	240.8	274.8	342.8	399.4	447.6	317.3	351.3	382.4	303.1	359.8	405.1
Exports	5.7	11.3	34.0	48.2	45.3	45.3	48.2	45.3	45.3	48.2	45.3	45.3
Imports	36.8	48.2	59.5	65.2	65.2	65.2	87.8	104.8	113.3	90.7	102.0	104.8
Demand on US forests	206.8	204.0	249.3	325.8	379.6	427.8	277.6	291.8	314.4	260.6	303.1	345.6
Supply from US forests[d]	206.8	204.0	249.3	286.1	303.1	325.8	286.1	303.1	325.8	286.1	303.1	325.8
Supply demand balance	0	0	0	39.7	76.5	102.0	−8.5	−11.3	−11.3	−25.5	0	19.8
Total US hardwood demand	99.2	87.8	85.0	121.8	155.8	198.3	113.3	133.1	161.5	110.5	138.8	181.3
Exports	0	2.8	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7	5.7
Imports	2.8	5.7	8.5	11.3	11.3	11.3	14.2	14.2	17.0	17.0	17.0	17.0
Demand on US forests	99.2	85.0	82.2	116.1	150.1	192.6	104.8	124.6	150.1	99.2	127.5	170.0

Table 10-1. Continued

Item	Estimated actual			Projections								
				1970 relative prices			Rising relative prices[b]			Relative prices above 1970 averages[c]		
	1952[a]	1962[a]	1970[a]	1980	1990	2000	1980	1990	2000	1980	1990	2000
Supply from US forests[d]	99.2	85.0	82.2	147.3	178.5	209.3	178.5	178.5	209.6	147.3	178.5	209.6
Supply demand balance	0	0	0	−31.2	−28.3	−17.0	−42.5	−53.8	−59.5	−48.2	−51.0	−39.7

[a] Data for 1952, 1962, and 1970 are estimates of actual consumption or harvest.

[b] Relative prices rising from their 1970 trend levels as follows: lumber 1.5% per year; plywood, miscellaneous products, and fuelwood 1.0% per year; paper and board 0.5% per year. This would mean a cumulative increase of 62% for lumber by 2000, and 17% for paper and board.

[c] Relative prices of lumber and plywood 30%, miscellaneous products and fuelwood 15%, and paper and board 10% above their 1970 averages.

[d] Base projections of supply are defined as the amount of timber that would be available if (1) forestry programs continued at 1970 levels, (2) timber removals in the East changed on a straight line basis from actual removals in 1970 to a balance with growth in 2000 and thereafter, (3) removals on private lands in the West followed trends suggested by 1970 management and operating practices, and allowable cuts on public lands remained at the 1970 level.

Source: Table 155 pp216–217 in USDA FS 1973.

10.2 VISIONS OF 2000

One way to quickly gain an appreciation of the past Timber Assessments is to examine the visions each had for the year 2000 (shown in Table 10-2). The year 2000 was often the end point of projections in early Timber Assessments and a midpoint in the 1980 and 1989 RPA Timber Assessments after the 1974 RPA legislation required 50-year projections.

These estimates fall within about 15% of the actual consumption in 2000 (see Figure 10-2). Generally they show smaller variation than might be expected given the underlying differences in determinants of consumption and underlying price assumptions in each Timber Assessment. There are some notable similarities. The earlier projections tend to overestimate softwood use and underestimate hardwood use. One reason is that they did not anticipate the increase in hardwood pulpwood use and growth in fuelwood consumption, especially hardwood fuelwood. This is evident in the projections made in the late 1980s when fuelwood demand, especially for industrial purposes, was expected to grow sharply. The earlier projections also did not anticipate the growth of softwood use for residential construction or repair

Table 10-2. Four projections of US roundwood consumption in 2000

Item	Projections[a]					Actual
	1965	1973	1980	1989	Average	2000
	Million cubic meters					
Softwood:						
Sawlogs	167.1	141.6	192.6	181.3	170.7	221.0
Veneer	51.0	42.5	42.5	31.2	41.8	31.2
Pulpwood	138.8	189.8	164.3	136.0	157.2	113.3
Miscellaneous	5.7	5.7	11.3	14.2	9.2	14.2
Fuelwood	2.8	2.8	8.5	25.5	9.9	8.5
Softwood total	365.4	382.4	419.3	388.8	388.8	388.1
Hardwood:						
Sawlogs	42.5	39.7	45.3	51.0	44.6	59.5
Veneer	11.3	11.3	11.3	8.5	10.6	5.7
Pulpwood	93.5	96.3	68.0	73.7	82.9	85.0
Miscellaneous	5.7	2.8	8.5	11.3	7.1	5.7
Fuelwood	14.2	11.3	31.2	96.3	38.3	36.8
Hardwood total	167.1	161.5	164.3	240.8	183.4	192.6
Total	532.6	543.9	583.6	628.9	572.3	580.7

[a] 1965–1989 are projections for 2000 that were made in the stated assessment year.

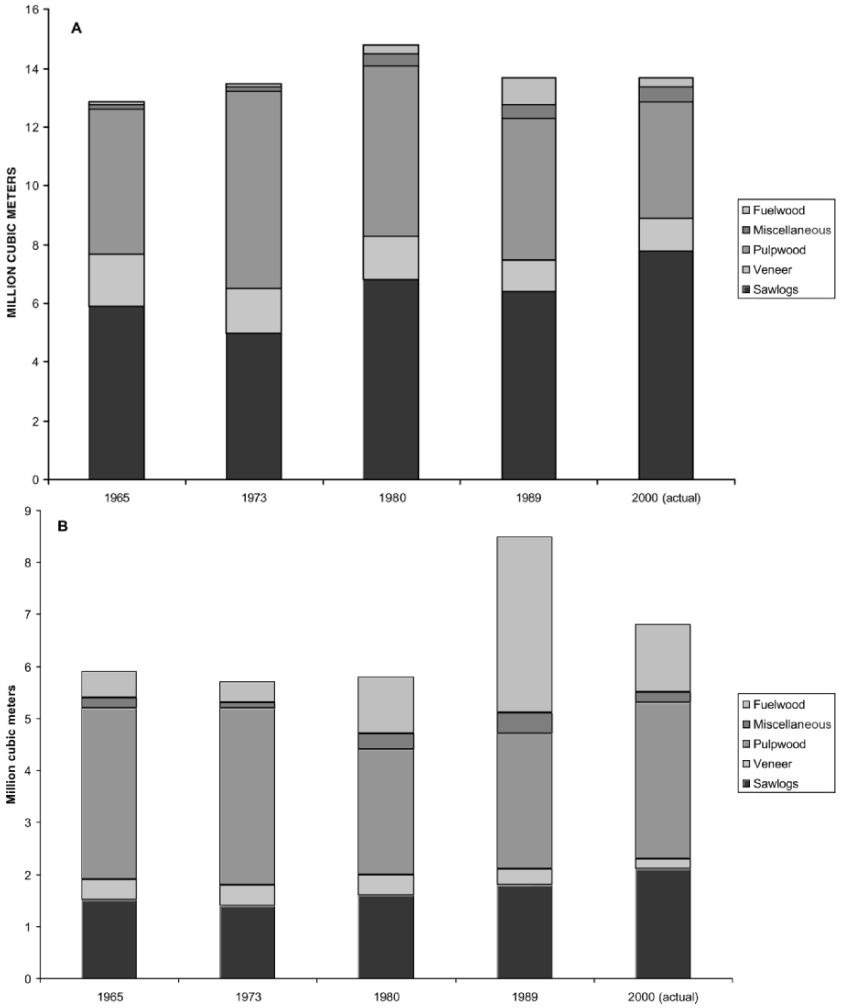

Figure 10-2. Projected and actual US consumption of softwood (A) and hardwood (B) roundwood in 2000.

and alteration. Nor did the projections, until the late 1980s, anticipate the increased use of recycled fibers in paper and paperboard production.

In spite of these differences, the past projections of overall consumption reflect a relatively consistent view of the future (other than for fuelwood use) and all would have provided about the same information for policy debates at least in regards to the major consumption items like sawtimber and pulpwood.

10.3 THE UNCERTAIN NATURE OF ASSUMPTIONS

Chapter 7 discussed the range of assumptions necessary to support an assessment of the US forest sector. Some of the differences between Tables 10-1 and 10-2 can be explained by differences in assumptions among the Timber Assessments. For example, different price assumptions in Table 10-1 result in different estimates of total US demand and imports, as these are assumed to be sensitive to (in this case) higher price levels. The differences in Table 10-2 reflect a wider variety in underlying assumptions, including population growth, future levels of public harvests, product consumption, and the US relation to the rest of the world.

10.3.1 Population

Figure 10-3 shows different projections of US population used in the Timber Assessments over the last 50 years. Each of these reflects the views at that time of the natural rate of increase and immigration. One obvious difference is how the post-World War II population growth rates were expected to continue in the 1960s. Now, 1962 is considered the end of the baby boom period. The higher population projections would lead to higher estimates of consumption (explaining, in part, some of the differences in Table 10-2).

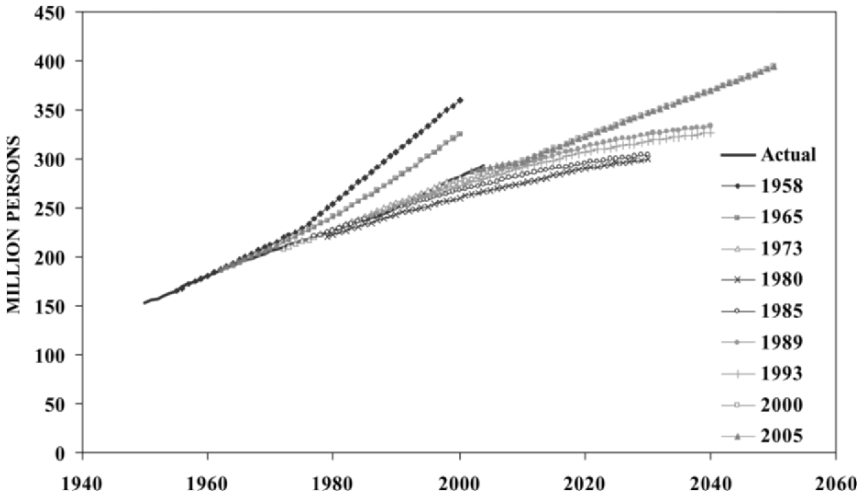

Figure 10-3. US population projections comparing nine Timber Assessments.

The Timber Assessments during the 1970s through the 1990s generally shared many of the same assumptions that underlie population projections. But the 2000 and 2005 RPA Timber Assessments recognize higher immigration and the large number of illegal immigrants already in the US. These latter projections suggest that the US population will increase by 35% by 2050, reaching the levels envisioned by the projections from the 1950s but delayed by 50 years. Population projection methods are well established, but some of the key inputs (such as fecundity and immigration) can change rapidly. These types of changes have led to the highly variable population projections observed in the Timber Assessment process over the last 50 years.

The Timber Assessment projections reflect the compounding of uncertainties in population and an array of other assumptions, such as technology and new product diffusion. Figure 10-3 suggests the range of uncertainty due to changing population projections. Technology assumptions are difficult because they depend both on the rate of innovation and adoption of new technologies or products. For example, the 1980 RPA Timber Assessment recognized the development of OSB and assumed that by 2000 OSB consumption would reach 15.9 Mm^3. Actual use was 10.5 Mm^3 and total structural panel consumption was 26.0 Mm^3.

10.3.2 National forest timber harvest

Controversy about timber programs on the national forests has been a constant throughout much of the time period covered by the Timber Assessments. In the Outlook Studies, greater road access in western national forests was seen as one way to expand timber supplies. In the RPA Timber Assessments, harvest level on national forests was seen as one of the main policy variables, either for increasing harvest to stem unacceptable price increases or reducing harvest to protect unique habitat.

Figure 10-4 summarizes the evolution of the national forests harvest assumptions used in the RPA Timber Assessments over the last 15 years. In general, harvest levels increased during the 1950s to match the increase in consumption following World War II. Harvests expanded as management on the national forests shifted from custodial to active forest management that focused on timber production. The intent was to convert the old-growth natural forests to managed forests, following volume regulation practices (see USDA FS 1963 for

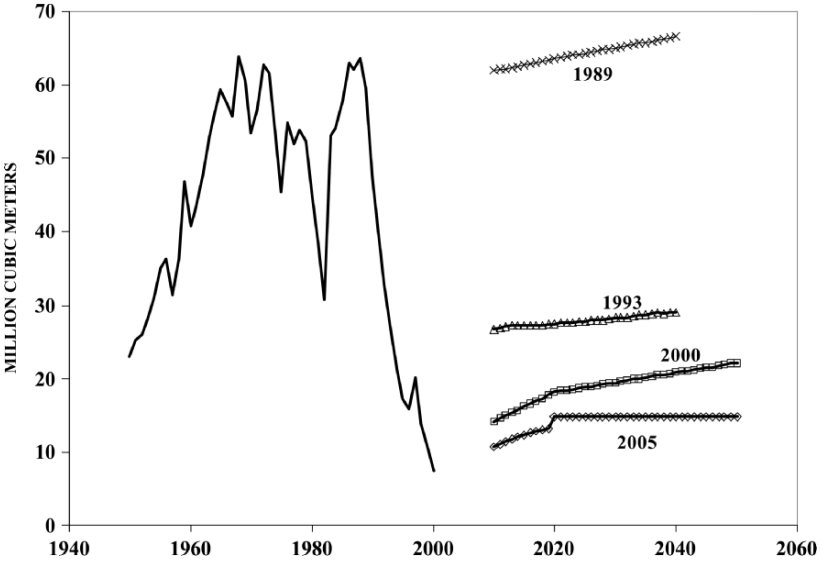

Figure 10-4. National forest softwood timber harvest comparing projections from 1989, 1993, 2000, 2005 RPA Timber Assessments.

details). Public pressure and changing legislation restricted harvest increases by the mid-1960s, and for the next two decades debate ensued over the size of the national forest timber program. The outcome of this debate was a sharp reduction in federal timber harvests in the 1990s. The details of this debate are covered in Chapter 11. The volatility of past national forest harvest illustrates how tenuous many assumptions can be when making long-term projections.

10.3.3 Trade assumptions

While the USA has been and is expected to remain a net importer of forest products, the treatment of trade in the Timber Assessments has changed markedly over time. In early reports, all trade flows were treated as exogenous. Table 10-1 provides one illustration of the role that trade assumptions can play. In that case they were increased to narrow the expected gap between supply and demand. In more recent studies, the Canadian sector has been included as an endogenous element of the projection. Most offshore flows remain exogenous (softwood lumber is a key exception), though efforts have been made

to employ projections for these flows that are consistent with projections from analytical trade models such as the IIASA GTM (Kallio et al. 1987) and FAO (1997).

10.4 HOUSING STARTS

While housing starts are considered one of a score of leading economic indicators, forest sector analysts usually give them great importance because of their prominence in policy debates. The broader issue is residential construction and consists of two specific assumptions used in later Timber Assessments. First, is the number of housing starts by type of construction (single family, multiple family, and mobile homes). Second, is the size of these units. These assumptions have varied greatly among Timber Assessments, reflecting changes in society's housing choices. The 1958 Outlook Study did not use the same amount of detail for describing demand by end-uses but rather described the annual requirements for new dwelling units in 2000 at three million units. It did note the trend (at that time relatively rapid) in the increase in proportion of single-family homes. It also noted that new single family homes were larger in 1958 than in 1950 when they averaged 93.3 m^2 per unit. The 1965 Outlook Study was the first to use the end-use detail familiar to Timber Assessment readers. The housing start assumptions from the 1965 Study, the 1980 RPA Timber Assessment, and the actual data for 2000 are shown below:

	Projected year 2000 housing starts		Actual year
Type of housing	1965	1980	2000 starts
		1,000 units	
Single family	1,530	1,410	1,231
Multifamily	1,170	550	342
Mobiles	200	340	251
Total	2,900	2,300	1,824

These forecasts illustrate how divergent views can be and are an important reason for variation in projections of softwood lumber used in home construction among the Timber Assessments.

Different views of how future US populations would be housed account for some of the differences shown in the tabulation above. In the early 1950s, the emphasis was on catching up with housing needs

following World War II. In 1965, housing discussions were still dominated by the post-World War II baby boom. In the early 1980s, in the midst of the most severe recession since the 1930s, we debated a future that included both housing the children born during the baby boom and increased interest rates that raised home financing costs to what seemed like unacceptable levels relative to incomes. Some industry analysts at the time thought the future would include a trend toward smaller and more affordable homes. However, house size has expanded even as household size has decreased. The floor area of average single-family homes at 218.2 m^2 in 2004 was more than double the average 1950 house size.

10.5 HOW HAVE OUR VIEWS OF THE FUTURE CHANGED OVER THE LAST 50 YEARS?

There are several major market indicators that illustrate different perspectives on how views of the future have evolved in the Timber Assessment over the last 50 years, including lumber and plywood production and timber harvest. The early projections of these measures and comparisons with the last decade offer insights that will help us judge the credibility of the current projections and projection methods.

10.5.1 Lumber and plywood production

The earlier Timber Assessments underestimated the growth in consumption of softwood lumber and structural panels.[2] This resulted from both differences in population projections as well as underestimates of wood used in residential construction. As discussed in Section 10.4, housing starts both in number and size have proven difficult to forecast.

Figure 10-5 shows projections of US softwood lumber consumption from the nine Timber Assessments. The differences between individual projections reflect underlying assumptions as previously described. But the projections are all consistent with a common view of the future, where growing populations consume ever larger amounts of softwood lumber. Figure 10-6 shows the nine different projections of

[2] Structural panels include softwood plywood and OSB. Prior to the introduction of OSB in late 1970s only softwood plywood was included.

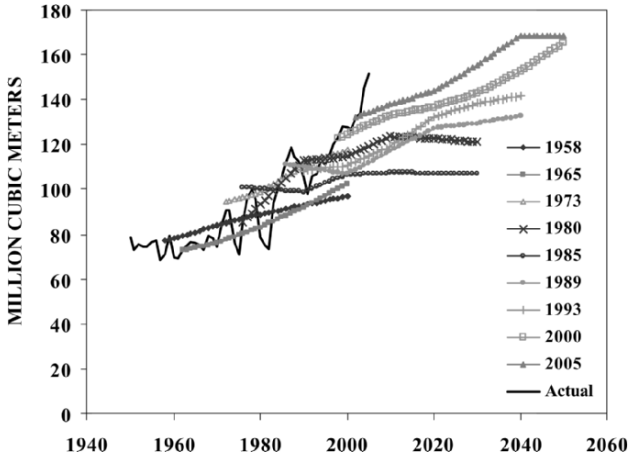

Figure 10-5. US softwood lumber consumption comparing nine Timber Assessments.

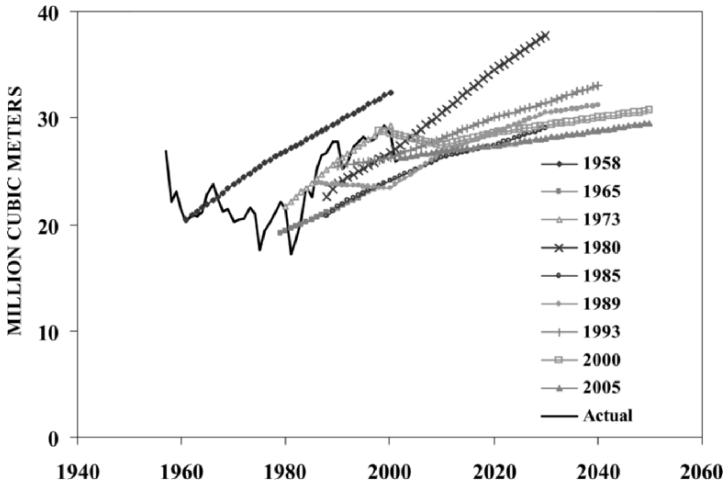

Figure 10-6. US hardwood lumber consumption comparing nine Timber Assessments.

hardwood lumber consumption. Like softwoods, the differences between individual projections reflect differences in underlying assumptions. Unlike softwoods the general shape of the projections reflects several shifts that have taken place over the last five decades. First, the increased availability of softwood lumber consistently graded and marketed has reduced local use of hardwoods especially for residential and nonresidential construction. This change took place faster

than assumed in the earlier Timber Assessments which had expected increased substitution of hardwood lumber for softwood lumber in construction uses. Second, much of the increase in hardwood lumber use came in shipping, mirroring the rapid increase in the use of pallets during the 1970s. In the last decade we have seen pallet use level off as pallet recycling and reuse have increased. Third, the recent increase in imported furniture to the US has reduced hardwood lumber use in domestic manufacturing. The higher production offshore for US markets has contributed to somewhat higher US hardwood lumber exports.

Figure 10-7 shows projections of US structural panel consumption from the nine Timber Assessments. Like the others, some of the differences between individual projections reflect differences in underlying market assumptions. Another factor is the assumption about the rate at which panel products will be adopted in various end-uses like residential construction. This is revealed by comparing projections from 1962 and onward that show how early analysts underestimated the speed at which panels would substitute first for lumber and later OSB for softwood plywood. But like lumber, the aggregate of all the projections is consistent in showing a rising trend over time.

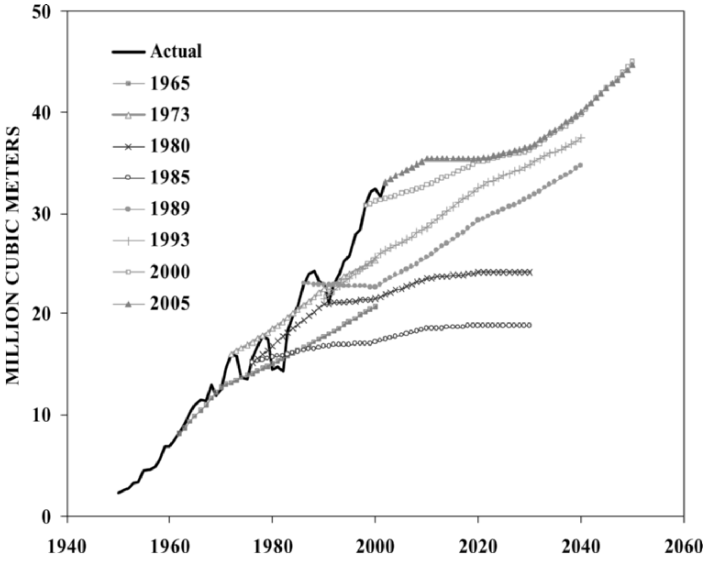

Figure 10-7. US structural panel consumption comparing nine Timber Assessments.

10.5.2 Timber harvest

Harvest estimates in the Timber Assessments interest a variety of people. Foresters see this as drain on forest resources and part of an indicator (as a ratio to growth) for assessing the sustainability of forest resources. Others are concerned if sufficient wood volumes are available to meet public needs. Still others are concerned about the role selected material flows or species could play either in meeting public needs or sustaining forest resources. Regardless of the reason, harvests are primary indicators emerging from assessments. US Timber Assessments have conventionally considered hardwood and softwood harvests separately because of the differences between the two sectors. The term "timber harvest" is used here specifically to mean the volume of timber harvested from all sources, growing stock and non-growing stock. Timber removals, in contrast, refer solely to timber cut from growing stock (see glossary for definitional details). The following sections examine historical assessment projections of harvest (from all sources) by species group and the reasons for variation in projections over time.

10.5.2.1 Softwood harvest

Figure 10-8 comprises a relatively uniform set of upward sloping softwood harvest projections, reflecting increases in the consumption of final products adjusted for changes in trade patterns. There are some differences among the projections, however. For example, the higher population projections in 1965 and the associated higher consumption led to higher domestic consumption. By the 1973 Outlook Study, the change in consumption projections, and the rapid rise in softwood lumber imports from Canada, led to reduced harvests. The Outlook Studies also did not anticipate how rapidly pulp and paper production would grow or the extent that both residues and hardwood roundwood would be substituted for softwood harvest. The softwood harvest projections made until the early 1990s also did not envision the extent of the decline in federal harvest resulting from efforts to protect habitat for endangered species. These efforts reduced harvest from federal timberlands by nearly 90%, dropping the federal share of softwood harvest from as much as 20% to less than 5% over roughly five years. These large changes led to structural changes in producing regions, reduced US exports, and increased imports of both lumber and structural panels from Canada.

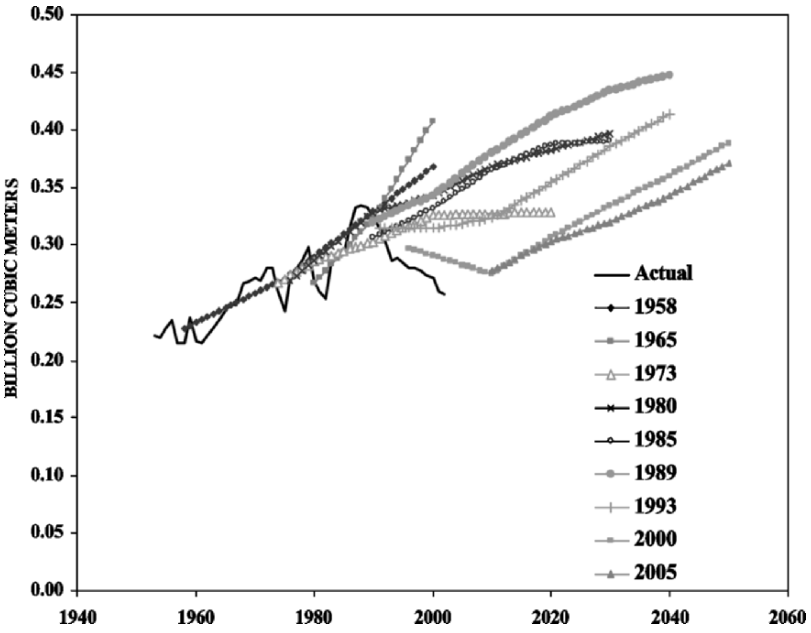

Figure 10-8. US softwood timber harvest data comparing nine Timber Assessments.

10.5.2.2 Hardwood harvest

Figure 10-9 for hardwood harvests illustrates that earlier projections did anticipate increases in harvest but for the wrong reasons. Until the late 1960s, there was a persistent belief that hardwood lumber would substitute for softwood lumber in various end-uses including housing and nonresidential building (primarily farm buildings). Instead hardwood lumber use in pallets increased, the growth of which exceeded earlier expectations. Also increased hardwoods were used in pulping, and after the mid-1970s for fuelwood. The difference in demands for high quality versus low quality hardwood lumber does have different land management implications.

The amount of hardwood used for fuelwood and pulpwood changed again during the 1990s. The 1990 RPA Timber Assessment anticipated high growth in both, but a decade later, the growth in fuelwood had diminished and pulp production had declined in the face of shifting global markets (see Chap. 13).

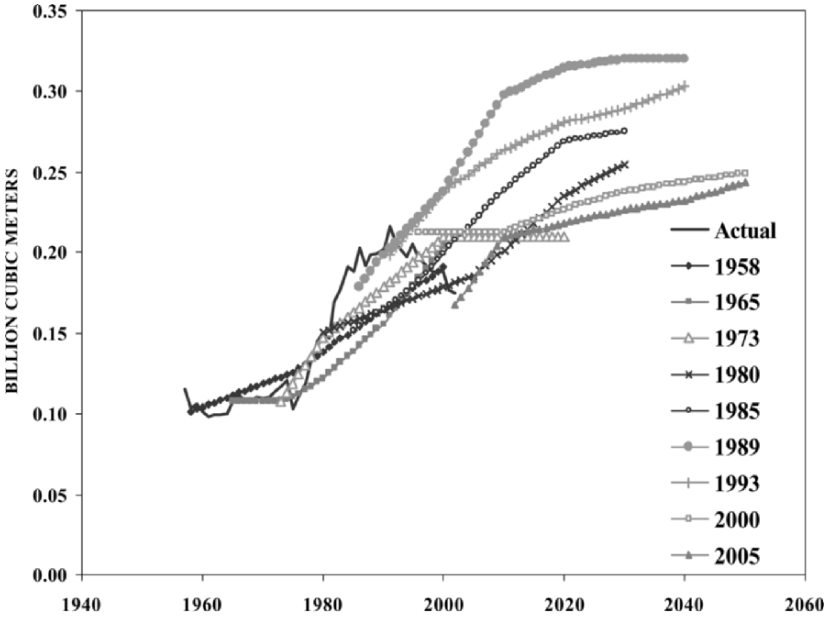

Figure 10-9. US hardwood timber harvest data comparing nine Timber Assessments.

10.5.2.3 Future harvests

Another way to gauge the different future views is to examine several estimates of harvest for a specific future year. We chose the year 2030, the most distant point projected in the 1980 study, and compared projected harvest from domestic forests. These projections were all developed by using the Assessment System, but each incorporates differences in underlying assumptions about public harvests, private land management assumptions, and changes in net trade.

	Year 2030 projected harvest	
Year of projection	Softwoods	Hardwoods
	Million cubic meters	
1980	461.7	260.6
1989	484.4	314.4
2000	441.9	243.6
Average	461.7	271.9

The 1980 and 1989 RPA Timber Assessments both projected higher hardwood consumption (though for different reasons as noted above). In the 1989 RPA Timber Assessment the hardwood sector was seen as benefiting from increased trade (where it was a net exporter) of relatively high-quality lumber into European and other markets and from increases in both fuelwood and low-quality lumber markets for pallets. The 2000 projection reflects a future where pulp and paper demand is less than the two earlier projections and imports provide a larger share of US consumption. Despite these differences, all of the projections continue to forecast substantial growth in harvest from current levels (29.7 and 16.7 Mm^3 for softwoods and hardwoods).

10.6 IMPROVING THE TREATMENT OF PRICES

The treatment of price assumptions became more critical as Timber Assessments were used as the basis for discussing the effectiveness of different programs and policies enacted to balance the outlook for timber supplies and demands. The 1958 and 1965 Outlook Studies focused on physical descriptions of the supply–demand gaps and assumed relative stability in product prices. This led to growing criticism of the policy inferences derived from the Timber Assessments by economists both those within the Forest Service and at universities. This criticism focused on the need to recognize the role that product prices play in balancing supply and demand of products, spatial differences in prices, and the links among product and stumpage prices. Some of the criticism stemmed from work in the early 1950s that suggested the use of spatial equilibrium approaches that could be simultaneously solved for prices and quantities in both product and stumpage markets.

Historical price data for softwood lumber and stumpage (Douglas-fir and southern pine) are shown in Figure 10-10. The prices are plotted in index form (1997 = 100). The annual rates of real price appreciation for the 98 years of data are 1.3% for softwood lumber, 5.1% for Douglas-fir stumpage, and 3.4% for southern pine sawtimber stumpage. The general relation of prices shown in Figure 10-10 reveals two very different periods, providing modest justification for the lack of specific treatment of prices in the Outlook Studies and the uncertainties introduced by price volatility in the RPA Timber Assessments. In the first period, 1900 through the mid-1960s, prices were relatively

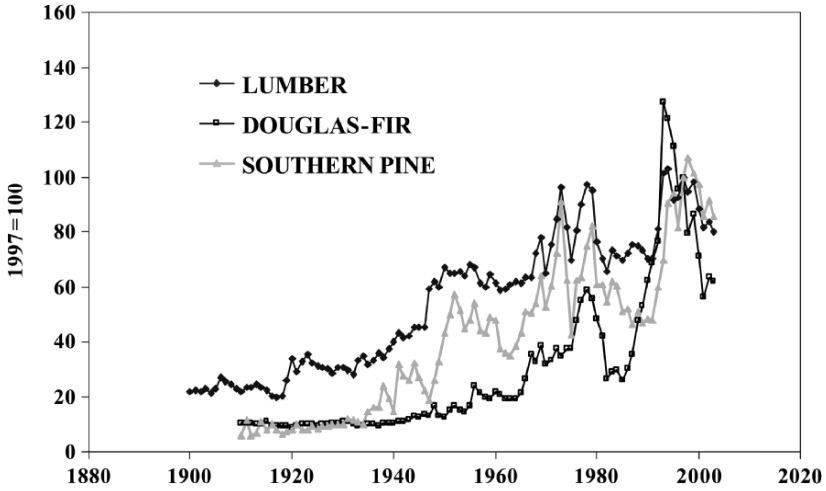

Figure 10-10. Historical real US lumber and stumpage prices in index form.

stable, other than for the jump in prices following the removal of World War II price controls. The relations among stumpage and lumber prices remained fairly stable during this period, lending credence to the argument that stumpage prices are some fixed proportion of lumber prices. In that context, some analysts modeled stumpage prices as a residual value determined by deducting logging and manufacturing costs from lumber prices. This relationship is the basis of residual value appraisal, which the Forest Service and many others still practice.

The second period, 1965 to the present, is characterized by greater volatility in the lumber price series as well as the relation between stumpage and lumber prices. Stumpage prices could no longer be assumed to be some fixed proportion of lumber prices. Instead the behavior of stumpage prices suggested that they were being set in markets that reflected a wider range of products than lumber alone. For example, both in the West and in the South, softwood plywood offered higher returns for larger logs. In the Douglas-fir region, log exports raised stumpage prices by increasing competition for high-quality logs meeting specific dimensions. In the South, variability in pulpwood markets changed the returns from year to year for small sawlogs. In both cases, increased price volatility in the forest sector after the mid-1960s reflected the first significant limitations on timber

supply in many decades and the restriction of lumber output expansion by available processing capacity.

The differences in the two time periods led to very different assumptions about price behavior among the Timber Assessments. For example, the 1965 Outlook Study assumed that future price trends (between 1962 and 2000) would not differ significantly from price trends for competing materials and that future "price induced" substitution between competing materials and timber products would be limited. Implicit in this price assumption are the further assumptions (1) that adequate stumpage supplies will be available throughout the projection period, and (2) that technological progress in the forest industries will keep pace with industries producing competing materials and contribute to the stability of relative prices. The assumption about adequate stumpage supplies was challenged by many who saw rising stumpage prices from 1950 through the 1960s (see Figure 10-10) as evidence that supplies were failing to keep up with rising demands. This especially became the case in the late 1960s as harvests on the national forests stabilized and harvests on private timberlands in the West started to fall.

The criticism led to more explicit treatment of price assumptions in the 1973 Outlook Study. Not only was there development and discussion about alternative price trends but also about how rising prices damped growth in consumption. Table 10-1 illustrates how rising prices were projected to further reduce consumption. For example, softwood consumption would be reduced 15% by 2000 assuming rising relative prices. Also, in the 1973 Outlook Study stumpage prices were tied directly to product prices as a fixed proportion of lumber prices.

Limitations in the approaches used in earlier Timber Assessments as well as the emerging use of prices as a policy variable led to the development of market models with endogenous prices in the Timber Assessments after 1973. The use of models that solved simultaneously for prices and quantities in spatially specified product and stumpage markets changed the interpretation of the outlook from one of differences in physical quantities to a discussion of the price implications. For example, the base projection from the 2000 RPA Timber Assessment (Haynes 2003) shows relatively limited growth in prices for softwood stumpage in the major producing regions. Sawtimber stumpage prices rise at less than 0.5% per year in the projection after 2010 in the South and Pacific Northwest West, while softwood pulpwood stumpage shows a strong cycle but no trend in the South. In

terms of underlying changes in softwood stumpage markets, demands for both sawtimber and pulpwood expand markedly in the projection, but supplies, albeit from different sources, keep pace and limit any price growth. In addition, increased dependence on global product markets helps limit US stumpage price growth.

Slow price growth represents a sharp break from the experience of the late 1980s and 1990s. But the unusual conditions of demand and supply that lead to rapid price growth in that period have changed, and price growth is expected to moderate as a result. At the same time, prices will not fall back to levels observed in the 1970s and early 1980s. Softwood stumpage prices took another, essentially permanent, step upward during the 1990s, just as they have in many similar periods in the past (consider the changes shown in Figure 10-10). And although the 2000 RPA Timber Assessment projection of modest long-term price growth is noteworthy in contrast to recent history, it is not a new result. The RPA Timber Assessments since 1989 have projected slower growth in softwood timber prices beginning in the 2000–2010 period based on essentially the same fundamental vision of future markets.

Figures 10-11a through 10-11d show the various price projections for the four products that have been treated consistently in the last six RPA Timber Assessments. Softwood lumber shows a drop in projected prices starting in 1990 reflecting, among other things, that expected future timber supplies have shifted outward as fast or faster than demand has grown. This is less the case for hardwood lumber until the 2000 and 2005 RPA Timber Assessments where hardwood lumber demand growth has slowed as pallet recycling has reduced expected lumber consumption. A slowing in the growth of demand also impacts some of the later paper and paperboard price projections where expected future US consumption and exports for some grades have decreased.

While price-based policy discussions dominated during the 1980s and early 1990s, recent policy debate has once again shifted away from prices. This is due in part to the relatively modest expectations for future price changes shown in the 2000 and 2005 RPA Timber Assessments. It also reflects broader policy concerns that now dominate the forestry community. Issues such as jobs versus the environment, progress toward sustainable forest management, and managing forests for ecosystem goods and services often involve indicators of multiple aspects of the forest sector rather than just the price effects.

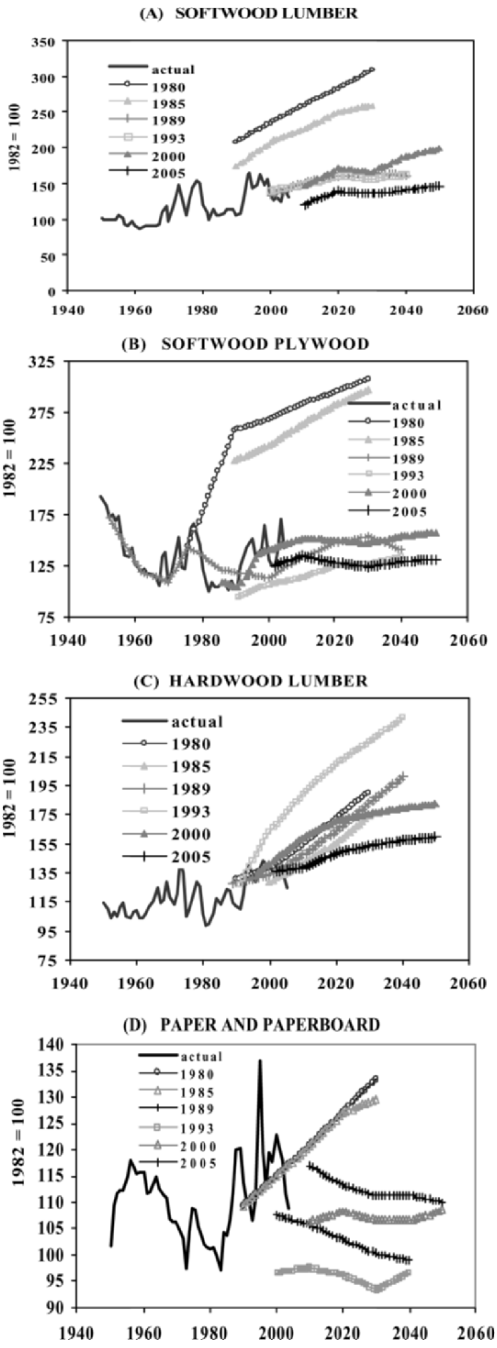

Figure 10-11. Product price projections from the RPA Timber Assessments.

10.6.1 Stumpage price projections

Views on whether product or stumpage price projections are more useful in forming judgments about the timber outlook and prospective ways to alter the outlook have changed over time. In the Outlook Studies, price discussions focused on product prices, especially softwood lumber (see Figs. 10-10 and 10-11a). There the concern was about substitution of wood with nonwood materials (e.g. concrete and steel), the extent of material substitution, and trends in various end uses of wood products. By the mid-1970s, however, the focus had shifted from product prices to stumpage prices. Factors responsible for this shift were the continued growth in demand for various forest products, the lack of extensive substitution from competing nonwood materials, and the intensity of the debate within the forestry community about different approaches to increase timber supplies to meet the increasing demands for wood products.

The shift from product price to stumpage price created some challenges. For example, the 1973 Outlook Study used a framework where stumpage prices were determined as a proportion of lumber prices. It was assumed that "75% of future increases in lumber product prices would go to stumpage" (p149 in USDA FS 1973). This "passthrough" technique was criticized for being inconsistent with derived demand concepts and distorting policy recommendations about the extent to which federal programs might affect regional stumpage availability (Haynes 1977). One of the goals in the 1980 RPA Timber Assessment was to develop a framework that would simultaneously balance supply and demand in both product and factor markets. In that way, the prices and quantities would represent market equilibrium in both product and factor (stumpage) markets.

The various stumpage price projections from the Timber Assessments are shown in Figures 10-12 for the Pacific Northwest West and 10-13 for the South. The relatively dramatic difference between projections from the 1980 and 1985 and later RPA Timber Assessments results in part from the incorporation of the effects of changes in management intensity on private lands. In the earlier projections sawtimber prices rose steadily in part because the inventory projection models (based on diameter distributions) were limited in their ability to consider how changes in management intensity could change future growth. In these projections, the base case assumption was that future management would be like past management. Growth rates or

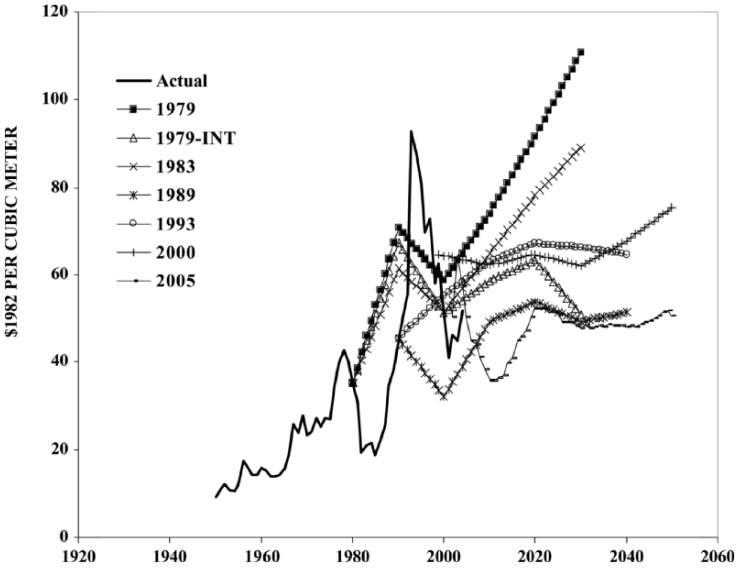

Figure 10-12. Softwood sawtimber stumpage prices in the Pacific Northwest West, with projections from six RPA Timber Assessments.

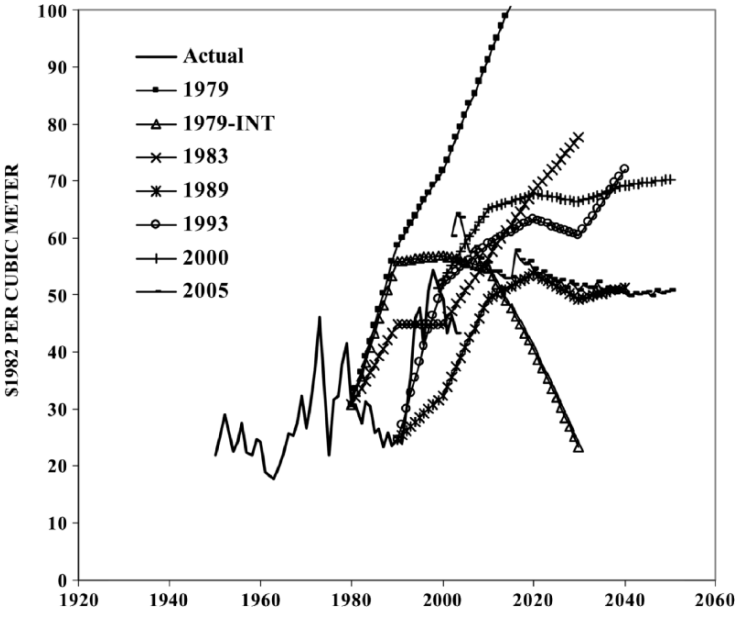

Figure 10-13. Softwood sawtimber stumpage prices in the South, with projections from six RPA Timber Assessments.

yield relations derived from historical data were assumed to reflect the effects of past management, and these were to remain unchanged for each region, species group (softwoods and hardwoods), and ownership.

Softwood sawtimber stumpage price forecasts since 1989 have all envisioned declining growth in prices after 2010 because they have assumed or projected higher future levels of management on private timberlands (see Chaps. 6 and 12 for details). Pulpwood prices have been projected only since the 1989 RPA Timber Assessment. It forecast a slow rise in Southern pulpwood prices to near 1960s levels by 2040, whereas the 1993 RPA Timber Assessment showed a shallow cycle returning to the same 2040 levels as the 1989 projection (see Figure 10-14).

The effects of higher estimates of inventory growth can be seen in a simulation experiment conducted in the 1980 RPA Timber Assessment (labeled "1980-INT" in Figures 10-12 and 10-13). In this analysis, diameter growth rates were adjusted upward to reflect a scenario of extensive investment in private forest management (see Adams et al. 1982 for details). The result, in both the Pacific Northwest West and

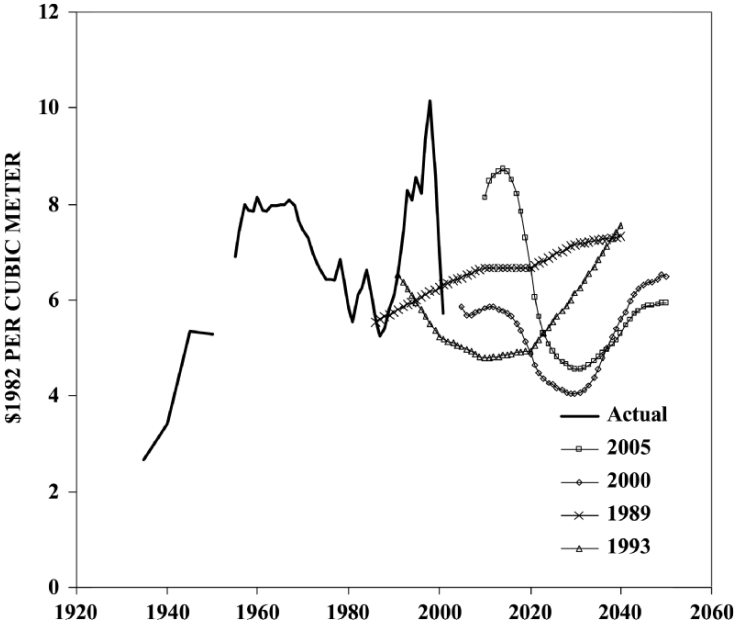

Figure 10-14. Softwood pulpwood stumpage price in the South, with projections from the 1989, 1993, and 2000 RPA Timber Assessments.

South, is stable to declining prices ten years into the projection. At least until 2020, this projection is much closer to the 2005 RPA Timber Assessment base than the static investment and growth scenario of the 1980 base.

10.7 CLOSING

Each of the nine Timber Assessments painted a view of the future that reflects the views of the time about key drivers of future conditions. They are the products of the events and concerns of the times in which they were made. While some of these concerns are temporary, others, relating to forest stewardship and industrial uses of wood, have endured throughout the 50-year period covered by past Timber Assessments and are nearly universal to forest sectors worldwide. These common concerns include: finding ways to increase timber supplies before price-based substitution reduces consumption excessively, understanding the role that improved harvesting or processing technologies can play in increasing supplies and employment opportunities, increasing forest growth through improved forest management, understanding how different landownership patterns influence forest management, and the role of markets to allocate resources and to provide incentives for both improved processing technology and forest stewardship.

The nine Timber Assessments are strikingly consistent in their description of futures that share a number of common elements based on different sets of assumptions. Much of this consistency is the result of a relatively robust general forecasting framework that is able to effectively organize increasingly sophisticated assumptions and process models. The use of spatial market models has been an important component of this framework and has contributed to the general consistency of projections over time. Stability in the general outlook also acts to increase policy analysts' confidence in the results. If the story does not change much over time under a changing array of conditions, people come to place some faith in it.

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